

RESPONSE

I. Status of the Claims

Prior to the present Action, claims 1-68, 102 and 103 were pending and have been examined. Presently, claims 1-7, 13-15, 41-43, 45-51, 66, 68, 102 and 103 have been amended without prejudice, to even further improve the clarity of the invention. No claims have been canceled. Claims 114-117 have been added, which are unified with the examined claims and fully supported by the specification as filed.

Claims 1-68 and 102-117 are therefore in the case. In accordance with 37 C.F.R. § 1.121, and for the convenience of the Examiner, copies of the pending claims are attached hereto. **Exhibit A** provides a clean copy of **all** claims, as requested, whereas **Exhibit B** shows the changes with brackets and underlining. The claims in each have been labeled as "(Amended)" or "(New)", where appropriate.

II. Allowed and Allowable Claims in the Second Action

Claims 54-65 have been allowed (second Action at summary page). The inclusion of claims 54-65 within the rejected claims (as a sub-set of claims 40-68) is in error (second Action at summary page; pages 3 and 4). Although the second Action at page 4 later characterizes claims 54-65 as "allowable", as claim 54 is an independent claim, each of claims 54-65 are allowed, as indicated at the summary page.

Each of claims 14-16, 26-34, 38 and 39 are also allowable, and are only "objected to" as being dependent on a rejected base claim, but are otherwise in condition for allowance (second Action at summary page; page 4).

A copy of the Examiner's initialed PTO Form 1449 listing the references timely made of record by the Applicants has still been omitted, despite Applicants' earlier request that it be

provided. Applicants therefore respectfully request that a copy be included in the Notice of Allowance, or in the next communication from the Office, to complete Applicants' records.

In the first Action, claims 1-47 and 49-68, *i.e.*, all but one pending claim, were indicated as allowed or allowable. MPEP 706.04 indicates that the rejection of previously allowed claims is "unusual" (MPEP at page 700-55, column 2) and further implies that this requires the citation of newly discovered reference(s) (MPEP at page 700-56, column 1), whereas the present rejection of allowed claims relies on the same art as in the first Action. Nonetheless, Applicants appreciate the allowance of several claims and the Examiner's suggestions to overcome the remaining rejection.

The present response overcomes the new rejections and all claims can be returned to allowed status.

III. Support for the Claims

Support for the amended and new claims exists in the pending claims, and also throughout the original specification as filed. Although additional fees should not be required for the new claims, any small entity fees deemed necessary for their introduction should be deducted from Williams, Morgan & Amerson, P.C. Deposit Account No. 50-0786/4100.002000.

In claim 1, element (b), has been revised without prejudice to reflect the allowable modified alginate matrices of claim 14, and the revision is supported thereby.

Also in claim 1, element (a), has been revised without prejudice to reflect one of the preferred embodiments of the invention, namely a structural matrix comprised of a porous "synthetic" polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer (matrices prepared by "GF/PL processes"). The use of "synthetic" polymers in the GF/PL processes of element (a), as opposed to "natural" polymers,

such as the alginates in element (b), is described throughout the specification, *e.g.* at pages 10, 44, 73, 74 and 119, with particular written description support at least at page 119, lines 15-17.

The definition of a structural matrix comprised of a porous "synthetic" polymer, as in claim 1, element (a), also accounts for the only change to each of claims 2-7, 41-43, 45-47, 49-51, 102 and 103.

Claim 13, which reflects element (b) of claim 1, as opposed to element (a), has been revised to accord with present claim 1 and to adopt the allowable language of claim 14.

Rather than canceling allowable claim 14, now used to place claim 1 in condition for allowance, Applicants elect to revise claim 14 to recite a modified alginate matrix in which an alginate chain section is bonded to a molecule that mediates cellular interactions "utilizing one or more uronic acid residues on the alginate chain section". This has literal written description support in the specification at least at page 118, lines 14-15.

Claim 15 has been revised to depend on claim 13.

The definition of the structural alginate matrices of the invention as those that comprise "at least one alginate chain section bonded to at least one molecule that mediates cellular interactions", as in claim 1, element (b) and claim 13, also accounts for the only change to claim 48.

Claims 66 and 68 include the same changes as made to claim 1, in element (a) and element (b), and are supported as set forth above.

New claim 104 is based upon allowable claims 26-29, and is supported thereby.

Claim 105 is based upon allowable claims 30 and 31, and is supported thereby.

New dependent claims 106, 107 and 108 are separately based upon allowable claims 32, 33 and 34, respectively, and are supported thereby.

Independent claim 109 and dependent claim 110 are separately based upon allowable claims 38 and 39, respectively, and are supported thereby.

New independent claim 111 and dependent claim 112 are separately based upon pending claims 11 and 12, respectively, and are supported thereby.

Claim 113 is based upon claim 1 with three revisions. First, the composition is clarified as a "structural matrix-nucleic acid composition", which is supported throughout the specification, with literal written description support at least at page 4, line 27 to page 5, line 13, for example. Second, the structural matrix has an "interconnected or open pore structure", as supported throughout the specification and exemplified by claims 3 and 4. Third, the structural matrix-nucleic acid composition promotes proliferation, migration, ingrowth or infiltration of cells into the structural matrix so that the cells take up and express the nucleic acid segment. This is a more positive recitation of certain inherent features of the invention, which is supported throughout the specification, with particular written description support at least at page 7, line 24 to page 8, line 2; page 15, line 22; page 25, line 15 to page 26, line 2; page 38, lines 18-20; page 41, lines 7-8; page 56, lines 5-11; page 69, lines 8-10; page 76, lines 12-21; page 77, lines 14-17; page 78, lines 3-4; page 79, lines 1-3; page 81, lines 29-30; page 82, lines 11-13; and at page 114, lines 4-7.

Claims 114 and 115 recite exemplary synthetic polymers, as described in the specification, *e.g.* at least at page 10, lines 23-25; page 44, lines 4-13; bridging pages 73 and 74; and at 119, lines 15-17.

Independent claim 116 includes the same additions as described above for claim 113; the definitions of element (a) and element (b) used in current claim 1; and the exemplary synthetic polymers of claim 114; and is supported as set forth above for claims 1, 113 and 114.

Finally, claim 117 reflects the PLGA copolymer matrices of claim 12, and is supported thereby.

It will therefore be understood that no new matter is included within any of the amended or new claims.

IV. Rejection of Claims 1-13, 17-25, 35-37, 40-68¹, 102 and 103 Under 35 U.S.C. § 102(b)

The only rejection in the case is that of claims 1-13, 17-25, 35-37, 40-68¹, 102 and 103 under 35 U.S.C. § 102(b) as allegedly being anticipated by the Wheatley *et al.* patent of record (U.S. Patent No. 4,933,185; "Wheatley"). Although Applicants respectfully traverse, the rejection is overcome.

A. Claims Allowed in the Second Action

Claims 54-65 are allowed¹ (second Action at summary page).

Claims 14-16, 26-34, 38 and 39 are indicated to be allowable, but are "objected to" as being dependent on a rejected base claim (second Action at summary page; page 4). Applicants respectfully traverse the rejection as applied to the claims 1-13, 17-25, 35-37, 40-68, 102 and 103, which is addressed and overcome below (**Section IV(B)**). Nonetheless, Applicants appreciate the indication of allowable claims and, without acquiescing with the rejection in any way, have placed various of these claims in independent form.

In particular, allowable dependent claims 26-29 have been combined to form independent claim 104; allowable dependent claims 30 and 31 have been combined to form independent claim 105; and allowable dependent claim 38 has been re-written as independent claim 109. Accordingly, each of claims 104-110 are now allowed.

¹Claims 54-65 are allowed. The rejection of claims 40-68 is therefore in error, and should read claims 40-53 and 66-68 (see **Section II**).

B. The Rejection is Overcome

Despite the previous allowance, claims 1-13, 17-25, 35-37, 40-68¹, 102 and 103 are newly rejected as allegedly being anticipated by Wheatley. The second Action interprets the rejected claims as being product-by-process claims, which were held not to recite sufficient structural limitations to distinguish over Wheatley (second Action at bottom of page 2).

The present invention concerns 3-dimensional structural matrix-nucleic acid compositions. The controlled porosity and other physical properties of the structural matrices allow for improved control over cellular migration, transfection and proliferation, thus allowing the number and type of cell populations that are exposed to the nucleic acids to be regulated. The structural matrix-nucleic acid compositions of the invention thus have advantageous *in vitro* and *in vivo* uses, including those in gene therapy and tissue engineering (specification at pages 4 and 5).

Wheatley concerns a system for the controlled release of biologically active compounds. However, despite some overlap in the terminology, Wheatley is very different to the presently claimed invention. Wheatley discloses a microcapsule having an outer skin, an inner polysaccharide core, a biologically active substance and a core-degrading enzyme, in which the enzyme degrades the core to release the biologically active substance (Wheatley at abstract; claim 1).

Wheatley thus provides a system for the *passive release* of biologically active substances. This is the opposite of the present invention, which provides structural matrix-nucleic acid compositions into which *cells migrate, encounter and take up the nucleic acids and express the encoded products* (specification at page 7, lines 25-27; see also pages 8, 15, 25, 26, 38, 41, 56, 69, 76, 77, 78, 79, 81, 82, and 114). The "structural" matrices of this invention thus provide

scaffolding through which cells migrate and encounter the nucleic acids and, in the context of tissue engineering, provide a surface for new tissue growth (specification at page 69; see also foregoing pages).

Wheatley does not teach or suggest compositions of "structural matrices" and nucleic acids as in the present invention, in which cells penetrate or grow into the structural matrices, contact and take up the nucleic acids therein and express the encoded products. Rather, the microcapsules of Wheatley simply provide a means of encapsulating biologically active substances which can be released upon degradation of the core. In fact, Wheatley actually teaches the opposite of the claimed invention in the encapsulation of biologically active substances within a semi-permeable membrane, *i.e.*, one that is permeable to oxygen, nutrients and small molecules, but impermeable to larger molecules and cells (Wheatley at column 1 and column 4).

Accordingly, in reciting compositions comprising nucleic acids in association with "structural matrices", the claims already sufficiently distinguished over the passive release microcapsules of Wheatley. Wheatley does not teach or suggest structural matrices with the controlled porosity and properties of the presently claimed matrices, or any structural matrix-nucleic acid composition wherein cells migrate into the structural matrix, take up and express the nucleic acids. All claims are thus patentable over Wheatley.

Although the properties of the claimed "structural" matrices are believed to have been clear, particularly when read in light of the specification, Applicants elect to further emphasize these inherent features of the invention by positively reciting additional properties of structural matrix-nucleic acid compositions in the claims. This is provided in claims 113 and 116, which recite structural matrix-nucleic acid compositions in which the matrix has an interconnected or

open pore structure and wherein the structural matrix-nucleic acid composition promotes proliferation, migration, ingrowth or infiltration of cells into the structural matrix such that the cells take up and express the nucleic acids.

Claims 113 and 116 thus positively recite features not taught or suggested in Wheatley. Claims are not required to distinguish over the prior art based upon structural limitations alone, but can also rely on claimed functional features to emphasize the novel and surprising aspects of an invention. Claims 113, 116 and 117 positively recite features not taught or suggested in Wheatley, and are thus further distanced from the cited art and in condition for allowance.

In addition to the features in claims 113, 116 and 117, and despite the fact that the claimed "structural" matrices already sufficiently distinguished over Wheatley, Applicants appreciate the guidance that the instant novelty rejection would be overcome by incorporating specific *structural* limitations to further distinguish the claims over Wheatley (second Action at top of pages 3 and 4). The present response thus even further distances the claimed invention from Wheatley on various grounds, and provides additional reasons to overcome the rejection.

As already appreciated by the second Action, the pending claims have many novel, surprising and thus patentable features, as embodied in allowed claims 54-65, allowable claims 14-16, 26-34, 38 and 39, and now in allowed claims 104-110. The following reasoning highlights additional structural features, as recited in the pending claims, which even further distinguish over Wheatley and place all claims in condition for allowance.

The structural matrices of the invention are of two general types: those with a unique porosity, which are prepared from porous polymers by gas foaming and particulate leaching ("GF/PL") processes, as in claim 1, element (a); and certain alginate or modified alginate matrices, as in claim 1, element (b). Wheatley is cited as disclosing microcapsules consisting of

alginate matrix for the controlled release of a biologically active substance (second Action at page 3), and is thus largely applied against claim 1, element (b) and other alginate matrix-nucleic acid claims.

Claim 14 is free from rejection over Wheatley and already allowable (second Action at summary page; page 4). Without acquiescing with the rejection as applied to other claims, and in order to progress the application to allowance as timely and cost-effectively as possible, Applicants elect to utilize allowable claim 14 to place claim 1 and other alginate matrix-nucleic acid claims in condition for allowance. Accordingly, claim 1, element (b), claims 13 and 48, and the relevant portions of claims 66, 68, have been revised to reflect the allowable modified alginate matrices of former claim 14. The rejection of these and the dependent claims is thus overcome.

Wheatley does not teach or suggest structural matrix-nucleic acid compositions in which the matrices are comprised of porous polymers with the unique type of structural porosity that results from a GF/PL process, or the functional attributes resulting from such structural GF/PL matrices. The rejection as applied to claim 1, element (a), is therefore misplaced. However, without acquiescing with the rejection in any way, and to adopt the Examiner's suggestions for increased emphasis on structural limitations, Applicants elect to place claim 1, element (a), and other GF/PL matrix-nucleic acid claims in condition for allowance by further defining *structural* components of the GF/PL porous polymer matrices.

Accordingly, claim 1, element (a), claims 2, 47 and 49, the relevant portions of claims 66, 68, and all pertinent dependent claims have been revised to recite structural matrices comprised of a porous "synthetic" polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer. This further distinguishes over Wheatley, which

concerns microcapsules formed from naturally-occurring polysaccharides, such as alginates. Indeed, Wheatley's teaching of the combined use of a core polysaccharide matched a core-degrading enzyme teaches away from the presently synthetic polymer matrices. Thus, claim 1, element (a), claims 2, 47, 49, 66, 68, and all claims dependent thereon, are even further distinguished over Wheatley on structural grounds and the rejection of these claims is overcome.

The foregoing explanations together overcome the rejection of each of claims 1-13, 17-25, 35-37, 40-51¹, 66-68¹, 102 and 103. Within these claims, are various examples of dependent claims that are even further distanced from Wheatley. For example, the interconnected and open pore structures of claims 3-5 and 7; the lactic acid and glycolic acid polymer and PLGA copolymer matrices of claims 11 and 12; and matrices formed by the processing steps of claims 17, 18 and 41-46.

Independent claims 111 and 112, based on claims 11 and 12, are also further distinguished over Wheatley. The exemplary synthetic polymer matrices of claims 114 and 115 (and claims 116 and 117 with additional functional language) are also further distanced from Wheatley.

The rejection of claims 51 and 52 is also overcome, as Wheatley does not teach or suggest admixtures comprising at least a first nucleic acid segment, beads or microspheres of a polymer capable of forming a gas-foamed polymeric structure, and a leachable particulate material.

Therefore, the § 102(b) rejection is overcome and all claims are in condition for allowance.

V. Conclusion

This is a complete response to the referenced Official Action. In conclusion, Applicants submit that, in light of the claims already allowed and the foregoing remarks, the present case is in condition for allowance and such favorable action is respectfully requested. Should Examiner Kaushal have any questions or comments, a telephone call to the undersigned Applicants' representative is earnestly solicited.



Respectfully submitted,

A handwritten signature in black ink, appearing to read "Shelley P.M. Fussey".

Shelley P.M. Fussey, Ph.D.
Reg. No. 39,458
Agent for Applicant

WILLIAMS, MORGAN & AMERSON, P.C.
10333 Richmond, Suite 1100
Houston, Texas, 77042
(713) 934-4079

Date: March 21, 2003

EXHIBIT A
PENDING CLAIMS
U.S. SERIAL NO. 09/442,542 (4100.002000; UM 1522p1)

1. (Twice Amended) A composition comprising at least a first nucleic acid segment in association with a structural matrix, wherein:
 - (a) at least a portion of said structural matrix is comprised of a porous, synthetic polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer; or
 - (b) at least a portion of said structural matrix is a porous, modified alginate matrix that comprises at least one alginate chain section bonded to at least one molecule that mediates cellular interactions.
2. (Amended) The composition of claim 1, wherein at least a portion of said structural matrix is comprised of a porous, synthetic polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer.
3. (Amended) The composition of claim 2, wherein at least a portion of said structural matrix is comprised of a porous, synthetic polymer that has an open pore structure.
4. (Amended) The composition of claim 3, wherein at least a portion of said structural matrix is comprised of a porous, synthetic polymer that has an interconnected pore structure.
5. (Amended) The composition of claim 2, wherein said structural matrix consists essentially of a porous, synthetic polymer that has an open pore structure.
6. (Amended) The composition of claim 2, wherein said structural matrix comprises at least a first matrix portion comprised of said porous, synthetic polymer integrally connected to at least a second matrix portion comprised of an impermeable polymer.
7. (Amended) The composition of claim 6, wherein said at least a first matrix portion is comprised of a porous, synthetic polymeric material that has a substantially uniform open pore structure, and wherein said at least a second matrix portion is comprised of the same synthetic polymeric material in a form that lacks an open pore structure.
8. The composition of claim 2, wherein said structural matrix is a biocompatible matrix.

9. The composition of claim 2, wherein said structural matrix is a biodegradable matrix.
10. The composition of claim 2, wherein said structural matrix is a biocompatible and biodegradable matrix.
11. The composition of claim 2, wherein at least a portion of said structural matrix is comprised of a lactic acid polymer, glycolic acid polymer or lactic acid/glycolic acid copolymer matrix.
12. The composition of claim 11, wherein at least a portion of said structural matrix is comprised of a lactic acid/glycolic acid (PLGA) copolymer matrix.
13. (Twice Amended) The composition of claim 1, wherein at least a portion of said structural matrix is a porous, modified alginate matrix that comprises at least one alginate chain section bonded to at least one molecule that mediates cellular interactions.
14. (Amended) The composition of claim 13, wherein at least a portion of said structural matrix is a modified alginate matrix that comprises at least one alginate chain section bonded to at least one molecule that mediates cellular interactions utilizing one or more uronic acid residues on said alginate chain section.
15. (Amended) The composition of claim 13, wherein at least a portion of said structural matrix is a modified alginate matrix that comprises at least one alginate chain section bonded to at least one cellular interaction molecule selected from the group consisting of cell adhesion molecules, cell attachment peptides, proteoglycan attachment peptide sequences, proteoglycans, cell adhesion polysaccharides, growth factors and cell adhesion enzymes.
16. The composition of claim 15, wherein at least a portion of said structural matrix is a modified alginate matrix that comprises at least one alginate chain section bonded to at least one cellular interaction molecule selected from the group consisting of an RGD peptide, fibronectin, vitronectin, Laminin A, Laminin B1, Laminin B2, collagen 1 and thrombospondin.
17. The composition of claim 13, wherein at least a portion of said structural matrix is a modified alginate matrix prepared by a method comprising:
 - (a) providing a solution of a hydrogel-forming material and a surfactant;

- (b) mixing said solution in the presence of a gas to form a stable foam;
- (c) exposing said stable foam to conditions or agents that result in gelling of the hydrogel-forming material and in the generation of gas bubbles therein; and
- (d) exposing the hydrogel containing gas bubbles to a vacuum to release the gas and form the hydrogel material having macroporous open pore porosity.

18. The composition of claim 13, wherein at least a portion of said structural matrix is a modified alginate matrix prepared by a method comprising:

- (a) providing a solution of a hydrogel-forming material, a surfactant and a gas-generating component, wherein said solution is capable of being mixed in the presence of a gas to incorporate the gas in the solution and form a stable foam;
- (b) mixing said solution in the presence of a gas to form a stable foam;
- (c) exposing said stable foam to conditions or agents that result in gelling of the hydrogel-forming material and to conditions or agents that result in generation of gas from the gas-generating component, to form a hydrogel containing gas bubbles therein; and
- (d) exposing said hydrogel containing gas bubbles therein to a vacuum to release the gas and to form the hydrogel material having macroporous open pore porosity.

19. The composition of claim 1, wherein said nucleic acid segment is a DNA molecule.

20. The composition of claim 1, wherein said nucleic acid segment is an antisense nucleic acid molecule or a ribozyme.

21. The composition of claim 1, wherein said nucleic acid segment is comprised within a plasmid or a recombinant expression vector.

22. The composition of claim 21, wherein said nucleic acid segment is operatively positioned downstream from a promoter within a recombinant viral expression vector.

23. The composition of claim 22, wherein said nucleic acid segment is operatively positioned downstream from a promoter within a recombinant adenovirus, a recombinant adeno-associated virus (AAV) or a recombinant retrovirus.

24. The composition of claim 21, wherein said nucleic acid segment encodes a protein or polypeptide.

25. The composition of claim 24, wherein said nucleic acid segment encodes a marker protein.

26. The composition of claim 24, wherein said nucleic acid segment encodes a protein or polypeptide that stimulates a bone progenitor cell when expressed in said cell.

27. The composition of claim 24, wherein said nucleic acid segment encodes a protein or polypeptide that stimulates a wound healing fibroblast, granulation tissue fibroblast or repair cell when expressed in said cell.

28. The composition of claim 24, wherein said nucleic acid segment encodes an antigenic or immunogenic protein or polypeptide that stimulates an immune response when expressed by an antigen presenting cell.

29. The composition of claim 24, wherein said nucleic acid segment encodes a cytotoxic or apoptosis-inducing protein or polypeptide that induces cell death upon expression in a cell.

30. The composition of claim 24, wherein said nucleic acid segment encodes a transcription or elongation factor, cell cycle control protein, kinase, phosphatase, DNA repair protein, oncogene, tumor suppressor, angiogenic protein, anti-angiogenic protein, immune response stimulating protein, cell surface receptor, accessory signaling molecule, transport protein, enzyme, anti-bacterial or anti-viral protein or polypeptide.

31. The composition of claim 24, wherein said nucleic acid segment encodes a hormone, neurotransmitter, growth factor, growth factor receptor, interferon, interleukin, chemokine, cytokine, colony stimulating factor or chemotactic factor protein or polypeptide.

32. The composition of claim 31, wherein said nucleic acid segment encodes a growth hormone (GH) protein or polypeptide, a parathyroid hormone (PTH) protein or polypeptide, a PTH1-34 polypeptide or a bone morphogenetic protein (BMP) protein or polypeptide.

33. The composition of claim 32, wherein said nucleic acid segment encodes a BMP-2A, BMP-2B, BMP-3, BMP-4, BMP-5, BMP-6, BMP-7 or BMP-8 protein or polypeptide.

34. The composition of claim 31, wherein said nucleic acid segment encodes a transforming growth factor- α (TGF- α), TGF- β 1 or TGF- β 2 protein or polypeptide, a latent TGF β binding protein (LTBP) protein or polypeptide, an activin/inhibin protein or polypeptide, a fibroblast growth factor (FGF), a granulocyte/macrophage colony stimulating factor (GMCSF), an epidermal growth factor (EGF), a platelet derived growth factor (PDGF), an insulin-like growth factor (IGF) or a leukemia inhibitory factor (LIF).

35. The composition of claim 24, wherein said nucleic acid segment encodes a human protein or polypeptide.

36. The composition of claim 1, comprising at least a first and second nucleic acid segment.

37. The composition of claim 1, comprising a plurality of nucleic acid segments.

38. The composition of claim 1, further comprising a population of cells.

39. The composition of claim 38, wherein at least a portion of said nucleic acid segment is taken up by the cells comprised within said composition.

40. The composition of claim 1, prepared by admixing at least a first nucleic acid segment with said structural matrix.

41. (Amended) The composition of claim 2, prepared by a process that comprises leaching out the particulate material from a composition comprising a gas foamed, synthetic polymeric material, at least a first nucleic acid segment and a leachable particulate material.

42. (Amended) The composition of claim 2, prepared by a process that comprises the steps of:

- (a) preparing an admixture comprising at least a first nucleic acid segment, particles capable of forming a synthetic polymeric structure and a leachable particulate material;

- (b) subjecting said admixture to a gas foaming process to create a porous, synthetic polymeric structure that comprises said at least a first nucleic acid segment and said leachable particulate material; and
- (c) subjecting said porous, synthetic polymeric structure to a leaching process that removes said leachable particulate material from said porous, synthetic polymeric structure, thereby producing a synthetic polymeric structure of additional porosity that comprises said at least a first nucleic acid segment.

43. (Amended) The composition of claim 42, wherein said admixture comprises said at least a first nucleic acid segment, beads or microspheres capable of forming a synthetic polymeric structure and said leachable particulate material.

44. The composition of claim 43, wherein said at least a first nucleic acid segment is incorporated within said beads or microspheres prior to said admixing or gas foaming steps.

45. (Amended) The composition of claim 42, wherein said leaching process is conducted *in vitro* by subjecting said porous, synthetic polymeric material to a leaching agent.

46. (Amended) The composition of claim 42, wherein said leaching process is conducted *in vivo* by exposing said porous, synthetic polymeric material to body fluids.

47. (Amended) A composition comprising at least a first nucleic acid segment in non-covalent association with a structural matrix, wherein at least a portion of said structural matrix is comprised of a porous, synthetic polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer.

48. (Twice Amended) A composition comprising at least a first nucleic acid segment in non-covalent association with a structural, porous modified alginate matrix that comprises at least one alginate chain section bonded to at least one molecule that mediates cellular interactions.

49. (Amended) A composition comprising at least a first nucleic acid segment in association with a structural matrix, said structural matrix comprising at least a first matrix portion comprised of a porous, synthetic polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer, wherein said first matrix portion is integrally connected to a second matrix portion comprised of an impermeable polymer.

50. (Amended) The composition of claim 49, wherein said first and second matrix portions are comprised of the same synthetic polymeric material, separately fabricated to form a first, porous, synthetic polymer having a uniform open pore structure and a second, impermeable synthetic polymer lacking an open pore structure.

51. (Amended) The composition of claim 49, wherein said first and second matrix portions are comprised of different synthetic polymeric materials.

52. An admixture, comprising at least a first nucleic acid segment; beads or microspheres of a polymer capable of forming a gas-foamed polymeric structure; and a leachable particulate material.

53. The admixture of claim 52, wherein said at least a first nucleic acid segment is incorporated within said beads or microspheres.

54. A method for making a structural matrix-nucleic acid composition, comprising providing at least a first nucleic acid segment to a structural matrix, wherein at least a portion of said structural matrix is comprised of a porous polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer.

55. The method of claim 54, comprising leaching out the particulate material from a composition comprising a gas foamed polymeric material, at least a first nucleic acid segment and a leachable particulate material.

56. The method of claim 55, comprising the steps of:

- (a) preparing an admixture comprising at least a first nucleic acid segment, particles of a polymeric material capable of forming a gas foamed polymeric structure and a leachable particulate material;
- (b) subjecting said admixture to a gas foaming process to create a porous polymeric structure that comprises said at least a first nucleic acid segment and said leachable particulate material; and
- (c) subjecting said porous polymeric structure to a leaching process that removes said leachable particulate material from said porous polymeric structure, thereby producing a polymeric structure of additional porosity that comprises said at least a first nucleic acid segment.

57. The method of claim 56, wherein said admixture is prepared by first incorporating said at least a first nucleic acid segment within said particles of a polymeric material and then admixing with said leachable particulate material.

58. The method of claim 57, wherein said admixture is prepared by first incorporating said at least a first nucleic acid segment within polymer beads or microspheres and then admixing with said leachable particulate material.

59. The method of claim 56, wherein the gas foaming process of step (b) comprises subjecting said admixture to an elevated pressure atmosphere of an inert gas in a manner effective to dissolve said gas into said polymeric material, and subjecting the gas-dissolved polymeric material to thermodynamic instability in a manner effective to cause nucleation and growth of gas pores sufficient to produce a continuous matrix of polymeric material that comprises said at least a first nucleic acid segment and said leachable particulate material.

60. The method of claim 59, wherein said thermodynamic instability is created by reducing said elevated pressure atmosphere.

61. The method of claim 56, wherein said leachable particulate material is a water-soluble leachable particulate material.

62. The method of claim 61, wherein said leachable particulate material is a salt, sugar or sugar alcohol.

63. The method of claim 62, wherein said leachable particulate material is NaCl, trehalose, glucose, sucrose or mannitol.

64. The method of claim 56, wherein said leaching process is conducted *in vitro* by contacting said porous polymeric material with a leaching agent.

65. The method of claim 56, wherein said leaching process is conducted *in vivo* by exposing said porous polymeric material to body fluids.

66. (Twice Amended) A kit comprising, in at least a first suitable container, at least a first nucleic acid segment and a structural matrix, wherein at least a portion of said structural matrix is a structural, porous modified alginate matrix that comprises at least one alginate chain section bonded to at least one molecule that mediates cellular interactions or a structural matrix comprised of a porous, synthetic polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer.

67. The kit of claim 66, wherein said at least a first nucleic acid segment and said structural matrix are physically associated within a single container.

68. (Twice Amended) An implantable device comprising at least a first nucleic acid segment in association with a structural matrix, wherein at least a portion of said structural matrix is a structural, porous modified alginate matrix that comprises at least one alginate chain section bonded to at least one molecule that mediates cellular interactions or a structural matrix comprised of a porous, synthetic polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer.

102. (Amended) The kit of claim 66, wherein at least a portion of said structural matrix is comprised of a porous, synthetic polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer.

103. (Amended) The implantable device of claim 68, wherein at least a portion of said structural matrix is comprised of a porous, synthetic polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer.

104. (New) A composition comprising at least a first nucleic acid segment in association with a structural matrix, wherein:

- (a) at least a portion of said structural matrix is comprised of a porous polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer; or
- (b) at least a portion of said structural matrix is a porous alginate or modified alginate matrix;

and wherein said nucleic acid segment encodes a protein or polypeptide that stimulates a bone progenitor cell, wound healing fibroblast, granulation tissue fibroblast or repair cell when expressed in said cell, or that stimulates an immune response when expressed by an antigen presenting cell, or that induces cell death upon expression in a cell.

105. (New) A composition comprising at least a first nucleic acid segment in association with a structural matrix, wherein:

- (a) at least a portion of said structural matrix is comprised of a porous polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer; or
- (b) at least a portion of said structural matrix is a porous alginate or modified alginate matrix;

and wherein said nucleic acid segment encodes a transcription or elongation factor, cell cycle control protein, kinase, phosphatase, DNA repair protein, oncogene, tumor suppressor, angiogenic protein, anti-angiogenic protein, immune response stimulating protein, cell surface receptor, accessory signaling molecule, transport protein, enzyme, anti-bacterial protein or polypeptide, anti-viral protein or polypeptide, hormone, neurotransmitter, growth factor, growth factor receptor, interferon, interleukin, chemokine, cytokine, colony stimulating factor or chemotactic factor protein or polypeptide.

106. (New) The composition of claim 105, wherein said nucleic acid segment encodes a growth hormone (GH) protein or polypeptide, a parathyroid hormone (PTH) protein or polypeptide, a PTH1-34 polypeptide or a bone morphogenetic protein (BMP) protein or polypeptide.

107. (New) The composition of claim 106, wherein said nucleic acid segment encodes a BMP-2A, BMP-2B, BMP-3, BMP-4, BMP-5, BMP-6, BMP-7 or BMP-8 protein or polypeptide.

108. (New) The composition of claim 105, wherein said nucleic acid segment encodes a transforming growth factor- α (TGF- α), TGF- β 1 or TGF- β 2 protein or polypeptide, a latent TGF β binding protein (LTBP) protein or polypeptide, an activin/inhibin protein or polypeptide, a fibroblast growth factor (FGF), a granulocyte/macrophage colony stimulating factor (GMCSF), an epidermal growth factor (EGF), a platelet derived growth factor (PDGF), an insulin-like growth factor (IGF) or a leukemia inhibitory factor (LIF).

109. (New) A composition comprising at least a first nucleic acid segment in association with a structural matrix, wherein:

- (a) at least a portion of said structural matrix is comprised of a porous polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer; or

- (b) at least a portion of said structural matrix is a porous alginate or modified alginate matrix;

and wherein said composition further comprising a population of cells.

110. (New) The composition of claim 109, wherein at least a portion of said nucleic acid segment is taken up by the cells comprised within said composition.

111. (New) A composition comprising at least a first nucleic acid segment in association with a structural matrix, wherein at least a portion of said structural matrix is comprised of a porous polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer; and wherein the polymer in said portion of said structural matrix is a lactic acid polymer, glycolic acid polymer or lactic acid/glycolic acid copolymer.

112. (New) The composition of claim 111, wherein at least a portion of said structural matrix is comprised of a lactic acid/glycolic acid (PLGA) copolymer matrix.

113. (New) A structural matrix-nucleic acid composition comprising at least a first nucleic acid segment in association with a structural matrix that has an interconnected or open pore structure, wherein:

- (a) at least a portion of said structural matrix is comprised of a porous polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer; or
- (b) at least a portion of said structural matrix is a porous alginate or modified alginate matrix;

and wherein said structural matrix-nucleic acid composition promotes proliferation, migration, ingrowth or infiltration of cells into said structural matrix and wherein said cells take up and express said nucleic acid segment.

114. (New) The composition of claim 2, wherein at least a portion of said structural matrix is comprised of a polyester, polyanhydride, polyphosphazine, poly(vinyl alcohol), poly(alkylene oxide), poly(allylamine), poly(acrylate), modified polystyrene or polyolefin polymer or copolymer.

115. (New) The composition of claim 114, wherein at least a portion of said structural matrix is comprised of a polyhydroxybutyrate, poly- ϵ -caprolactone, poly(ethylene oxides), poly(4-aminomethylstyrene), poly(vinylpyrrolidone), polyethylene, polypropylene or polyethylene terephthalate polymer or copolymer.

116. (New) A structural matrix-nucleic acid composition comprising at least a first nucleic acid segment in association with a structural matrix that has an interconnected or open pore structure, wherein:

- (a) at least a portion of said structural matrix is comprised of a porous, synthetic polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer; wherein said synthetic polymer is a lactic acid, glycolic acid, lactic acid/glycolic acid, polyester, polyanhydride, polyphosphazine, poly(vinyl alcohol), poly(alkylene oxide), poly(allylamine), poly(acrylate), modified polystyrene or polyolefin polymer or copolymer; or
- (b) at least a portion of said structural matrix is a porous, modified alginate matrix that comprises at least one alginate chain section bonded to at least one molecule that mediates cellular interactions;

and wherein said structural matrix-nucleic acid composition promotes proliferation, migration, ingrowth or infiltration of cells into said structural matrix and wherein said cells take up and express said nucleic acid segment.

117. (New) The composition of claim 116, wherein said synthetic polymer is a lactic acid/glycolic acid (PLGA) copolymer matrix.

EXHIBIT B
PENDING CLAIMS
U.S. SERIAL NO. 09/442,542 (4100.002000; UM 1522p1)

1. (Twice Amended) A composition comprising at least a first nucleic acid segment in association with a structural matrix, wherein:
 - (a) at least a portion of said structural matrix is comprised of a porous, synthetic polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer; or
 - (b) at least a portion of said structural matrix is a porous, [alginate or] modified alginate matrix that comprises at least one alginate chain section bonded to at least one molecule that mediates cellular interactions.
2. (Amended) The composition of claim 1, wherein at least a portion of said structural matrix is comprised of a porous, synthetic polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer.
3. (Amended) The composition of claim 2, wherein at least a portion of said structural matrix is comprised of a porous, synthetic polymer that has an open pore structure.
4. (Amended) The composition of claim 3, wherein at least a portion of said structural matrix is comprised of a porous, synthetic polymer that has an interconnected pore structure.
5. (Amended) The composition of claim 2, wherein said structural matrix consists essentially of a porous, synthetic polymer that has an open pore structure.
6. (Amended) The composition of claim 2, wherein said structural matrix comprises at least a first matrix portion comprised of said porous, synthetic polymer integrally connected to at least a second matrix portion comprised of an impermeable polymer.
7. (Amended) The composition of claim 6, wherein said at least a first matrix portion is comprised of a porous, synthetic polymeric material that has a substantially uniform open pore structure, and wherein said at least a second matrix portion is comprised of the same synthetic polymeric material in a form that lacks an open pore structure.
8. The composition of claim 2, wherein said structural matrix is a biocompatible matrix.

9. The composition of claim 2, wherein said structural matrix is a biodegradable matrix.
10. The composition of claim 2, wherein said structural matrix is a biocompatible and biodegradable matrix.
11. The composition of claim 2, wherein at least a portion of said structural matrix is comprised of a lactic acid polymer, glycolic acid polymer or lactic acid/glycolic acid copolymer matrix.
12. The composition of claim 11, wherein at least a portion of said structural matrix is comprised of a lactic acid/glycolic acid (PLGA) copolymer matrix.
13. (Twice Amended) The composition of claim 1, wherein at least a portion of said structural matrix is a porous, [alginate or] modified alginate matrix that comprises at least one alginate chain section bonded to at least one molecule that mediates cellular interactions.
14. (Amended) The composition of claim 13, wherein at least a portion of said structural matrix is a modified alginate matrix that comprises at least one alginate chain section bonded to at least one molecule that mediates cellular interactions utilizing one or more uronic acid residues on said alginate chain section.
15. (Amended) The composition of claim [14] 13, wherein at least a portion of said structural matrix is a modified alginate matrix that comprises at least one alginate chain section bonded to at least one cellular interaction molecule selected from the group consisting of cell adhesion molecules, cell attachment peptides, proteoglycan attachment peptide sequences, proteoglycans, cell adhesion polysaccharides, growth factors and cell adhesion enzymes.
16. The composition of claim 15, wherein at least a portion of said structural matrix is a modified alginate matrix that comprises at least one alginate chain section bonded to at least one cellular interaction molecule selected from the group consisting of an RGD peptide, fibronectin, vitronectin, Laminin A, Laminin B1, Laminin B2, collagen 1 and thrombospondin.
17. The composition of claim 13, wherein at least a portion of said structural matrix is a modified alginate matrix prepared by a method comprising:
 - (a) providing a solution of a hydrogel-forming material and a surfactant;

- (b) mixing said solution in the presence of a gas to form a stable foam;
- (c) exposing said stable foam to conditions or agents that result in gelling of the hydrogel-forming material and in the generation of gas bubbles therein; and
- (d) exposing the hydrogel containing gas bubbles to a vacuum to release the gas and form the hydrogel material having macroporous open pore porosity.

18. The composition of claim 13, wherein at least a portion of said structural matrix is a modified alginate matrix prepared by a method comprising:

- (a) providing a solution of a hydrogel-forming material, a surfactant and a gas-generating component, wherein said solution is capable of being mixed in the presence of a gas to incorporate the gas in the solution and form a stable foam;
- (b) mixing said solution in the presence of a gas to form a stable foam;
- (c) exposing said stable foam to conditions or agents that result in gelling of the hydrogel-forming material and to conditions or agents that result in generation of gas from the gas-generating component, to form a hydrogel containing gas bubbles therein; and
- (d) exposing said hydrogel containing gas bubbles therein to a vacuum to release the gas and to form the hydrogel material having macroporous open pore porosity.

19. The composition of claim 1, wherein said nucleic acid segment is a DNA molecule.

20. The composition of claim 1, wherein said nucleic acid segment is an antisense nucleic acid molecule or a ribozyme.

21. The composition of claim 1, wherein said nucleic acid segment is comprised within a plasmid or a recombinant expression vector.

22. The composition of claim 21, wherein said nucleic acid segment is operatively positioned downstream from a promoter within a recombinant viral expression vector.

23. The composition of claim 22, wherein said nucleic acid segment is operatively positioned downstream from a promoter within a recombinant adenovirus, a recombinant adeno-associated virus (AAV) or a recombinant retrovirus.

24. The composition of claim 21, wherein said nucleic acid segment encodes a protein or polypeptide.

25. The composition of claim 24, wherein said nucleic acid segment encodes a marker protein.

26. The composition of claim 24, wherein said nucleic acid segment encodes a protein or polypeptide that stimulates a bone progenitor cell when expressed in said cell.

27. The composition of claim 24, wherein said nucleic acid segment encodes a protein or polypeptide that stimulates a wound healing fibroblast, granulation tissue fibroblast or repair cell when expressed in said cell.

28. The composition of claim 24, wherein said nucleic acid segment encodes an antigenic or immunogenic protein or polypeptide that stimulates an immune response when expressed by an antigen presenting cell.

29. The composition of claim 24, wherein said nucleic acid segment encodes a cytotoxic or apoptosis-inducing protein or polypeptide that induces cell death upon expression in a cell.

30. The composition of claim 24, wherein said nucleic acid segment encodes a transcription or elongation factor, cell cycle control protein, kinase, phosphatase, DNA repair protein, oncogene, tumor suppressor, angiogenic protein, anti-angiogenic protein, immune response stimulating protein, cell surface receptor, accessory signaling molecule, transport protein, enzyme, anti-bacterial or anti-viral protein or polypeptide.

31. The composition of claim 24, wherein said nucleic acid segment encodes a hormone, neurotransmitter, growth factor, growth factor receptor, interferon, interleukin, chemokine, cytokine, colony stimulating factor or chemotactic factor protein or polypeptide.

32. The composition of claim 31, wherein said nucleic acid segment encodes a growth hormone (GH) protein or polypeptide, a parathyroid hormone (PTH) protein or polypeptide, a PTH1-34 polypeptide or a bone morphogenetic protein (BMP) protein or polypeptide.

33. The composition of claim 32, wherein said nucleic acid segment encodes a BMP-2A, BMP-2B, BMP-3, BMP-4, BMP-5, BMP-6, BMP-7 or BMP-8 protein or polypeptide.

34. The composition of claim 31, wherein said nucleic acid segment encodes a transforming growth factor- α (TGF- α), TGF- β 1 or TGF- β 2 protein or polypeptide, a latent TGF β binding protein (LTBP) protein or polypeptide, an activin/inhibin protein or polypeptide, a fibroblast growth factor (FGF), a granulocyte/macrophage colony stimulating factor (GMCSF), an epidermal growth factor (EGF), a platelet derived growth factor (PDGF), an insulin-like growth factor (IGF) or a leukemia inhibitory factor (LIF).

35. The composition of claim 24, wherein said nucleic acid segment encodes a human protein or polypeptide.

36. The composition of claim 1, comprising at least a first and second nucleic acid segment.

37. The composition of claim 1, comprising a plurality of nucleic acid segments.

38. The composition of claim 1, further comprising a population of cells.

39. The composition of claim 38, wherein at least a portion of said nucleic acid segment is taken up by the cells comprised within said composition.

40. The composition of claim 1, prepared by admixing at least a first nucleic acid segment with said structural matrix.

41. (Amended) The composition of claim 2, prepared by a process that comprises leaching out the particulate material from a composition comprising a gas foamed, synthetic polymeric material, at least a first nucleic acid segment and a leachable particulate material.

42. (Amended) The composition of claim 2, prepared by a process that comprises the steps of:

- (a) preparing an admixture comprising at least a first nucleic acid segment, particles capable of forming a synthetic polymeric structure and a leachable particulate material;

- (b) subjecting said admixture to a gas foaming process to create a porous, synthetic polymeric structure that comprises said at least a first nucleic acid segment and said leachable particulate material; and
- (c) subjecting said porous, synthetic polymeric structure to a leaching process that removes said leachable particulate material from said porous, synthetic polymeric structure, thereby producing a synthetic polymeric structure of additional porosity that comprises said at least a first nucleic acid segment.

43. (Amended) The composition of claim 42, wherein said admixture comprises said at least a first nucleic acid segment, beads or microspheres capable of forming a synthetic polymeric structure and said leachable particulate material.

44. The composition of claim 43, wherein said at least a first nucleic acid segment is incorporated within said beads or microspheres prior to said admixing or gas foaming steps.

45. (Amended) The composition of claim 42, wherein said leaching process is conducted *in vitro* by subjecting said porous, synthetic polymeric material to a leaching agent.

46. (Amended) The composition of claim 42, wherein said leaching process is conducted *in vivo* by exposing said porous, synthetic polymeric material to body fluids.

47. (Amended) A composition comprising at least a first nucleic acid segment in non-covalent association with a structural matrix, wherein at least a portion of said structural matrix is comprised of a porous, synthetic polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer.

48. (Twice Amended) A composition comprising at least a first nucleic acid segment in non-covalent association with a structural, porous [alginate or] modified alginate matrix that comprises at least one alginate chain section bonded to at least one molecule that mediates cellular interactions.

49. (Amended) A composition comprising at least a first nucleic acid segment in association with a structural matrix, said structural matrix comprising at least a first matrix portion comprised of a porous, synthetic polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer, wherein said first matrix portion is integrally connected to a second matrix portion comprised of an impermeable polymer.

50. (Amended) The composition of claim 49, wherein said first and second matrix portions are comprised of the same synthetic polymeric material, separately fabricated to form a first, porous, synthetic polymer having a uniform open pore structure and a second, impermeable synthetic polymer lacking an open pore structure.

51. (Amended) The composition of claim 49, wherein said first and second matrix portions are comprised of different synthetic polymeric materials.

52. An admixture, comprising at least a first nucleic acid segment; beads or microspheres of a polymer capable of forming a gas-foamed polymeric structure; and a leachable particulate material.

53. The admixture of claim 52, wherein said at least a first nucleic acid segment is incorporated within said beads or microspheres.

54. A method for making a structural matrix-nucleic acid composition, comprising providing at least a first nucleic acid segment to a structural matrix, wherein at least a portion of said structural matrix is comprised of a porous polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer.

55. The method of claim 54, comprising leaching out the particulate material from a composition comprising a gas foamed polymeric material, at least a first nucleic acid segment and a leachable particulate material.

56. The method of claim 55, comprising the steps of:

- (a) preparing an admixture comprising at least a first nucleic acid segment, particles of a polymeric material capable of forming a gas foamed polymeric structure and a leachable particulate material;
- (b) subjecting said admixture to a gas foaming process to create a porous polymeric structure that comprises said at least a first nucleic acid segment and said leachable particulate material; and
- (c) subjecting said porous polymeric structure to a leaching process that removes said leachable particulate material from said porous polymeric structure, thereby producing a polymeric structure of additional porosity that comprises said at least a first nucleic acid segment.

57. The method of claim 56, wherein said admixture is prepared by first incorporating said at least a first nucleic acid segment within said particles of a polymeric material and then admixing with said leachable particulate material.

58. The method of claim 57, wherein said admixture is prepared by first incorporating said at least a first nucleic acid segment within polymer beads or microspheres and then admixing with said leachable particulate material.

59. The method of claim 56, wherein the gas foaming process of step (b) comprises subjecting said admixture to an elevated pressure atmosphere of an inert gas in a manner effective to dissolve said gas into said polymeric material, and subjecting the gas-dissolved polymeric material to thermodynamic instability in a manner effective to cause nucleation and growth of gas pores sufficient to produce a continuous matrix of polymeric material that comprises said at least a first nucleic acid segment and said leachable particulate material.

60. The method of claim 59, wherein said thermodynamic instability is created by reducing said elevated pressure atmosphere.

61. The method of claim 56, wherein said leachable particulate material is a water-soluble leachable particulate material.

62. The method of claim 61, wherein said leachable particulate material is a salt, sugar or sugar alcohol.

63. The method of claim 62, wherein said leachable particulate material is NaCl, trehalose, glucose, sucrose or mannitol.

64. The method of claim 56, wherein said leaching process is conducted *in vitro* by contacting said porous polymeric material with a leaching agent.

65. The method of claim 56, wherein said leaching process is conducted *in vivo* by exposing said porous polymeric material to body fluids.

66. (Twice Amended) A kit comprising, in at least a first suitable container, at least a first nucleic acid segment and a structural matrix, wherein at least a portion of said structural matrix is a structural, porous [alginate or] modified alginate matrix that comprises at least one alginate chain section bonded to at least one molecule that mediates cellular interactions or a structural matrix comprised of a porous, synthetic polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer.

67. The kit of claim 66, wherein said at least a first nucleic acid segment and said structural matrix are physically associated within a single container.

68. (Twice Amended) An implantable device comprising at least a first nucleic acid segment in association with a structural matrix, wherein at least a portion of said structural matrix is a structural, porous [alginate or] modified alginate matrix that comprises at least one alginate chain section bonded to at least one molecule that mediates cellular interactions or a structural matrix comprised of a porous, synthetic polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer.

102. (Amended) The kit of claim 66, wherein at least a portion of said structural matrix is comprised of a porous, synthetic polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer.

103. (Amended) The implantable device of claim 68, wherein at least a portion of said structural matrix is comprised of a porous, synthetic polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer.

104. (New) A composition comprising at least a first nucleic acid segment in association with a structural matrix, wherein:

- (a) at least a portion of said structural matrix is comprised of a porous polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer; or
- (b) at least a portion of said structural matrix is a porous alginate or modified alginate matrix;

and wherein said nucleic acid segment encodes a protein or polypeptide that stimulates a bone progenitor cell, wound healing fibroblast, granulation tissue fibroblast or repair cell when expressed in said cell, or that stimulates an immune response when expressed by an antigen presenting cell, or that induces cell death upon expression in a cell.

105. (New) A composition comprising at least a first nucleic acid segment in association with a structural matrix, wherein:

- (a) at least a portion of said structural matrix is comprised of a porous polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer; or
- (b) at least a portion of said structural matrix is a porous alginate or modified alginate matrix;

and wherein said nucleic acid segment encodes a transcription or elongation factor, cell cycle control protein, kinase, phosphatase, DNA repair protein, oncogene, tumor suppressor, angiogenic protein, anti-angiogenic protein, immune response stimulating protein, cell surface receptor, accessory signaling molecule, transport protein, enzyme, anti-bacterial protein or polypeptide, anti-viral protein or polypeptide, hormone, neurotransmitter, growth factor, growth factor receptor, interferon, interleukin, chemokine, cytokine, colony stimulating factor or chemotactic factor protein or polypeptide.

106. (New) The composition of claim 105, wherein said nucleic acid segment encodes a growth hormone (GH) protein or polypeptide, a parathyroid hormone (PTH) protein or polypeptide, a PTH1-34 polypeptide or a bone morphogenetic protein (BMP) protein or polypeptide.

107. (New) The composition of claim 106, wherein said nucleic acid segment encodes a BMP-2A, BMP-2B, BMP-3, BMP-4, BMP-5, BMP-6, BMP-7 or BMP-8 protein or polypeptide.

108. (New) The composition of claim 105, wherein said nucleic acid segment encodes a transforming growth factor- α (TGF- α), TGF- β 1 or TGF- β 2 protein or polypeptide, a latent TGF β binding protein (LTBP) protein or polypeptide, an activin/inhibin protein or polypeptide, a fibroblast growth factor (FGF), a granulocyte/macrophage colony stimulating factor (GMCSF), an epidermal growth factor (EGF), a platelet derived growth factor (PDGF), an insulin-like growth factor (IGF) or a leukemia inhibitory factor (LIF).

109. (New) A composition comprising at least a first nucleic acid segment in association with a structural matrix, wherein:

- (a) at least a portion of said structural matrix is comprised of a porous polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer; or

- (b) at least a portion of said structural matrix is a porous alginate or modified alginate matrix;

and wherein said composition further comprising a population of cells.

110. (New) The composition of claim 109, wherein at least a portion of said nucleic acid segment is taken up by the cells comprised within said composition.

111. (New) A composition comprising at least a first nucleic acid segment in association with a structural matrix, wherein at least a portion of said structural matrix is comprised of a porous polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer; and wherein the polymer in said portion of said structural matrix is a lactic acid polymer, glycolic acid polymer or lactic acid/glycolic acid copolymer.

112. (New) The composition of claim 111, wherein at least a portion of said structural matrix is comprised of a lactic acid/glycolic acid (PLGA) copolymer matrix.

113. (New) A structural matrix-nucleic acid composition comprising at least a first nucleic acid segment in association with a structural matrix that has an interconnected or open pore structure, wherein:

- (a) at least a portion of said structural matrix is comprised of a porous polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer; or
- (b) at least a portion of said structural matrix is a porous alginate or modified alginate matrix;

and wherein said structural matrix-nucleic acid composition promotes proliferation, migration, ingrowth or infiltration of cells into said structural matrix and wherein said cells take up and express said nucleic acid segment.

114. (New) The composition of claim 2, wherein at least a portion of said structural matrix is comprised of a polyester, polyanhydride, polyphosphazine, poly(vinyl alcohol), poly(alkylene oxide), poly(allylamine), poly(acrylate), modified polystyrene or polyolefin polymer or copolymer.

115. (New) The composition of claim 114, wherein at least a portion of said structural matrix is comprised of a polyhydroxybutyrate, poly- ϵ -caprolactone, poly(ethylene oxides), poly(4-aminomethylstyrene), poly(vinylpyrrolidone), polyethylene, polypropylene or polyethylene terephthalate polymer or copolymer.

116. (New) A structural matrix-nucleic acid composition comprising at least a first nucleic acid segment in association with a structural matrix that has an interconnected or open pore structure, wherein:

- (a) at least a portion of said structural matrix is comprised of a porous, synthetic polymer that contains pores formed by gas foaming and pores formed by leaching out of a particulate from the polymer; wherein said synthetic polymer is a lactic acid, glycolic acid, lactic acid/glycolic acid, polyester, polyanhydride, polyphosphazine, poly(vinyl alcohol), poly(alkylene oxide), poly(allylamine), poly(acrylate), modified polystyrene or polyolefin polymer or copolymer; or
- (b) at least a portion of said structural matrix is a porous, modified alginate matrix that comprises at least one alginate chain section bonded to at least one molecule that mediates cellular interactions;

and wherein said structural matrix-nucleic acid composition promotes proliferation, migration, ingrowth or infiltration of cells into said structural matrix and wherein said cells take up and express said nucleic acid segment.

117. (New) The composition of claim 116, wherein said synthetic polymer is a lactic acid/glycolic acid (PLGA) copolymer matrix.